INVESTIGATION OF THE DISSOLVED AND FLOATING MATERIAL OF THE TISZA AND MAROS

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The investigations were begun in 1951 and continued in 1952.

The quantity and quality of the dissolved salts, the amount of the floating material and its distribution according to the size of the granules were determined.

Every week water samples were taken from three different places. (Fig. 1.) From the Tisza in the vicinity of the ferry at Tápé, a little higher than the mouth of the Maros and at Szeged in the neigbourhood of the Boszorkánysziget about 5 km below the mouth of the Maros, where could be assumed that the two rivers mix completely, and finally from the Maros, approximately three and a half km from Deszk.

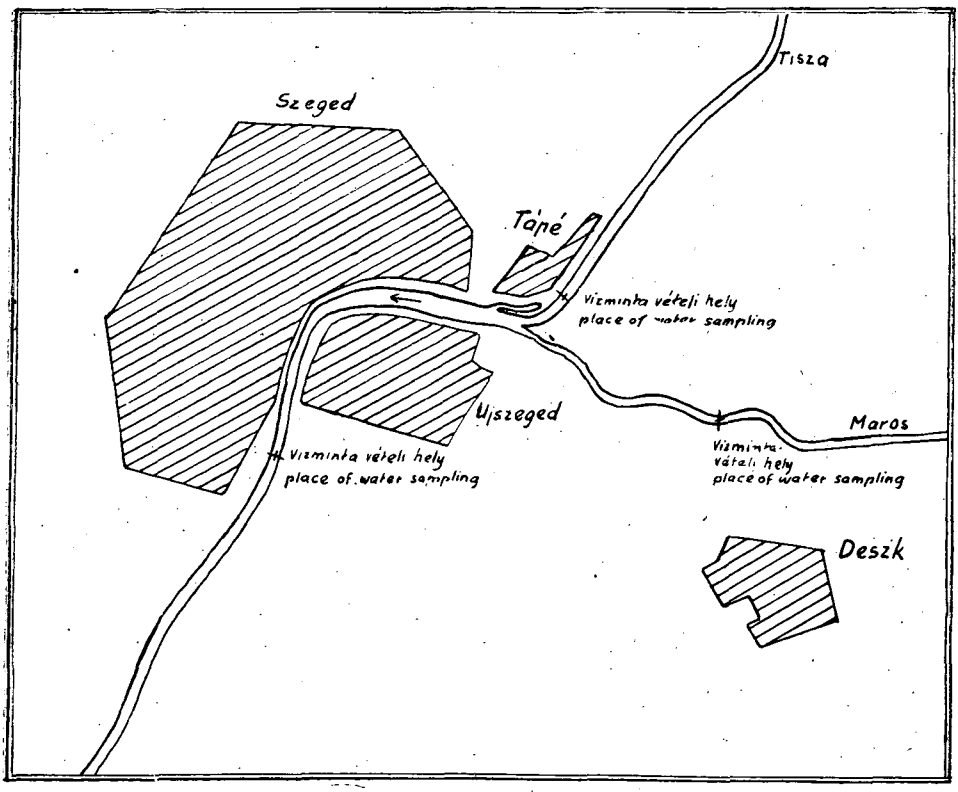

Fig. 1.

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During April the samples were only taken at Szeged, as then the Tisza owing to the high water level emerges from her bed and joins the Maros at a section above the mouth. In the second half of April the water level of the Maros was relatively low resulting in the surplus water of the Tisza damming the Maros which influenced the composition of the salts dissolved in its water to such an extent that the result of the analysis of the water sample taken on April 24th at Deszk corresponded almost completely with that taken from the Tisza at Szeged.

	Maros (Deszk) April 24	Tisza (Szeged) April 21
calcium ion	32,95 mg/l	32,07 mg/l
sodium ion	10,32	9,79
potassium ion	3,02	3,10
iron ion	0,26	0,26
hydrocarbonate ion	100,22	99,45
total oxide	6,40	6,10
alcalinity	1,64°	1,63°

The sampling was performed by the Branch of the Hungarian Hydrographical Institute at Szeged. At every sampling one liter of water was taken along the current from ten different depths, the obtained 10 liter of water were sedimented. This material was, as in the case of our previous investigation (1951), separated into clayey, muddy and sandy fractions. The water used for the chemical analysis was filtered through qualitative filter paper. Once a month at each sampling place the amount of the free oxygen and free carbon dioxide absorbed in the water was determined.

Considering that from the geochemical point of view only results based on systematic investigations can be used, the following facts were already taken into consideration from the beginning:

1. The sodium- and potassium ions, the calcium- and magnesium ions, as the carbonate and hydrocarbonate ions were separatedly determined. Furthermore, the sulphate- and phoshate ions, the iron- and chloride ions, all the dissolved salt, the total oxide, the silica, the undissolved residue, all the organic substances, the free oxygen and free carbon dioxide content of the water were also determined, as well as the alkalinity and the degree of hardness. Considering its minimum amount the manganese ion was estimated qualitatively once a month. Spectrographic examination of the trace elements was carried out by Mrs. M. Földváry to whom we are very grateful for her kind cooperation.

2. In each case the water samples were taken along the current of the Tisza and Maros respectively, at the site where the water mixed the best. Thus as regards both the floating and dissolved salts the most characteristic data of the rivers were obtained.

3. Considering that in the case of the Tisza the given water level always relates to Szeged and that of the Maros to Makó the amount of water flowing down can be calculated and thus a conclusion concerning the total quantity of the dissolved and floating material of the rivers reached.

The qualitative results of the investigations relating to the dissolved salt substance of the Tisza and Maros are illustrated on the graphs of Fig. 2. (see Tables 1—6.)

The quantity and quality of the total dissolved salt varies very much periodically, thus it can only be examined as a function of the water level. Concerning the quantitative changes the previous establishments that in the case of a high water level the amount of dissolved salts is smaller and in that of low water level higher, i. e. that the concentration increases, is valid. It showed a maximum at low water level on October 3rd. 0,44 g/l and a minimum in winter when the water is unusually high on December 1st. 0,13 g/l.

Total oxide (R_2O_3). Under this term the total iron, manganese, aluminum, titane and phosphate amounts are summarised, They were approximately identical in both rivers. Between spring and autumn a gradual decrease could be observed. Considering that the total oxide group involves in addition to aluminum also iron, manganese, titane and phosphate this enables the drawing of conclusions as to the amount of the aluminum oxide. The mean value of the total oxide in the Maros at high water level is 6,5 mg/l subtracting the values of 0,23 mg/l of Fe_2O_3 and 0,12 mg/l of P_2O_5 (manganese occurred only rarely in traces and titane not at all) the amount of aluminum was 6,15 mg/l. In the Tisza at Tápé at high water level on the same basis the amount of the aluminum was 5,4 mg/l. At low water level in the Maros the total oxide amount is 2,83 mg/l, of this Al_2O_3 is 2,58 mg/l. In the Tisza at Tápé the total oxide amounts to 3,45 mg/l (Al_2O_3 3,31 mg/l).

The calcium ion can be ranged among the most sensitive ions as regards the fluctuations of the water level. It changes with nearly every fluctuation of the water level. It changes with nearly every fluctuation of the tide. At low water level the calcium ion content of the Maros was usually were only carried out systematically at Szeged, the calcium ion content was 55,6 mg/l on September 1st and at Szeged 58,7 mg/l on September 10th. In the course of April when owing to the high water level the measurings were only carried out systematically at Szeged, the calcium ion content was throughout approximately the same 30 mg/l. At high water levels the minimum in the Tisza at Tápé was 26,70 mg/l on November 26th, at Szeged 24,58 mg/l on November 19th and in the Maros at Deszk 27,65 mg/l on March 28th.

The quantitative fluctuations of the magnesium ion are relatively insignificant and a quantitative change corresponding to the water level could not be demonstrated. In both rivers the values obtained were approximately the same. The mean value was at high water level in the Tisza at Tápé 8,28 mg/l, at Szeged 7,04 mg/l, in the Maros at Deszk 8,32 mg/l. At low water level it was in the Tisza at Tápé 8,28 mg/l, at Szeged 8,16 mg/l, in the Maros at Deszk 8,20 mg/l.

The quantity of the sodium ion was the whole year round — with the exception of a few cases — both at high and low water levels always greater in the Maros than in the Tisza. At low water levels with the increase of the dissolved salt concentration the sodium ion content rose too. In the Maros high values were obtained at low water level, e. g. on October 3rd 47,8 mg/l, on October 17th 49,4 mg/l. The influence exercised by the Maros on the Tisza at Szeged was well visible, inasmuch as the sodium ion content ranged almost always between that of the values of Tápé and the Maros. A maximum was measured on September 10th (35,58 mg/l) and at Tápé the maximum value was 32,35 mg/l on September 8th.

The change of the potassium ion was in proportion to that of the sodium ion, its quantity remaining, however, well below the value of the

latter. In the Maros it increased quantitatively particularly during the summer and autumn, the maximum also fell into this period it amounted to 6,25 mg/l on September 5th and 6,65 mg/l on October 10th. In the same period it was at Tápé 3,76 mg/l on September 8th and 2,71 mg/l on October 6th. The fluctuations of the potassium ion ranged in both rivers between low limits throughout the year, save for a few extreme cases, it varied between 2—4 mg/l.

The amount of the iron ion increased with the rising of the tide, at lower water levels it was lower, both rivers contained it in about the same quantity. The mean value was at low water level 0,09—0,11 mg/l, at high water level 0,16—0,21 mg/l. At high water levels in winter its amount increased to a great extent in the Tisza at Tápé, e. g. on December 30eth it was 0,46 mg/l.

The manganese ion were always only present, in very small amounts, qualitatively they could only rarely be detected, this minimum amount also being mostly a characteristic feature of high water levels.

The amount of chloride ion in the Maros was generally the double of that found in the Tisza at Tápé. In March high values were obtained when the tide of the Maros flowed down, as well as after the flowing down of the summer tide when the maximum was attained on July 18th 79,50 mg/l and on March 21st 68,10 mg/l. After the flowing down of the tide the chloride ion content of the water of the river decreased in both cases. In the course of the summer months the diminished quantity rose again gradually, as the concentration increased. In samlpes taken from the Tisza at Tápé, with the exception of two cases, the chloride ion content was usually low, 10—20 mg/l. At Szeged the chloride ion content was owing to the greater amount of sodium chloride contained in the Maros, always higher than in the Tisza at Tápé.

The amount of the hydrocarbonate ion corresponds to the change in the quantity of the calcium ion. At high water levels it was low, at low water levels it was higher in both rivers. The whole year round it was less in the Tisza than in the Maros. These values ran parallel depending on the water level. In the beginning of the summer and the course of it the amount of the hydrocarbonate ion increased gradually. It reached its maximum at the end of August and beginning of September, in the Tisza at Tápé on September 8th it was 201,30 mg/l, in the Maros on September 5th, 181,17 mg/l.

The carbonate ion could be already detected in the Maros, as well as in the Tisza at Tápé in June, but only in subordinate amounts at Szeged it played a still less important role. In July it occurred at all three sampling sites in smaller and larger quantities amounting on the average to 2—4 mg/l. In August it increased in certain cases, particularly at the section of the Tisza at Szeged to 8—9 mg/l. In September it again diminished to the minimum failing completely at several samples from the Maros. With the exception of the periods mentioned the carbonate ion failed to occur in either of the rivers.

Concerning the sulphate ion in general the values were almost corresponding in both rivers amounting to about 30 mg/l. In the Tisza at Tápé the maximum was 41,59 mg/l on July 28th, whereas in the Maros after the flowing down of the winter tide it amounted to 60,17 mg/l on March 14th.

After the flowing down of the spring tide at Tápé somewhat higher values were obtained throughout the measurings than in the Maros, in the course of the autumn tides on the other hand those of the Maros were higher.

Phosphate ion occurred only in very slight quantities amounting to 0,1—0,2 mg/l in both rivers. This amount increased rather in the course of the autumn and winter months.

At high water level the degree of alkalinity was lower and at low water level higher in both rivers, thus both the Tisza and the Maros showend in the summer a higher degree of alkalinity, the maximum was also reached in the summer and autum, respectively, amounting to 3,87° in the Tisza at Tápé on September 8th and to 3,60° in the Maros at Deszk on September 3rd. With the exception of a few cases the degree of alkalinity of the Tisza exceeded that of the Maros. In the Tisza at Szeged at permanently high water levels the degree of alkalinity remained constant 1,6°.

The degree of the hardness of water corresponded like that of the alkalinity to the water level. In both rivers the degrees of hardness were the whole year round save for slight fluctuation approximately similar. The degrees of hardness rose gradually after the flowing down of the spring tide. Reaching the maximum in both rivers in September.

Silicon could generally be found in larger quantities in the Maros, than in the Tisza. In the Maros it amounted to 11—12 mg/l, in the Tisza at Tápé to 7—9 mg/l.

The term insoluble residue involves the clayey fragments probably colloidal clayey fragments which passed into the filtrate at the filtering and could be found as residue at the determination of the silicic acid. They reached their maximum — as anticipitated — when the clayey, muddy fraction of the floating material increased. In such cases, owing to the presence of the colloid substances, the water sample did not clear for weeks.

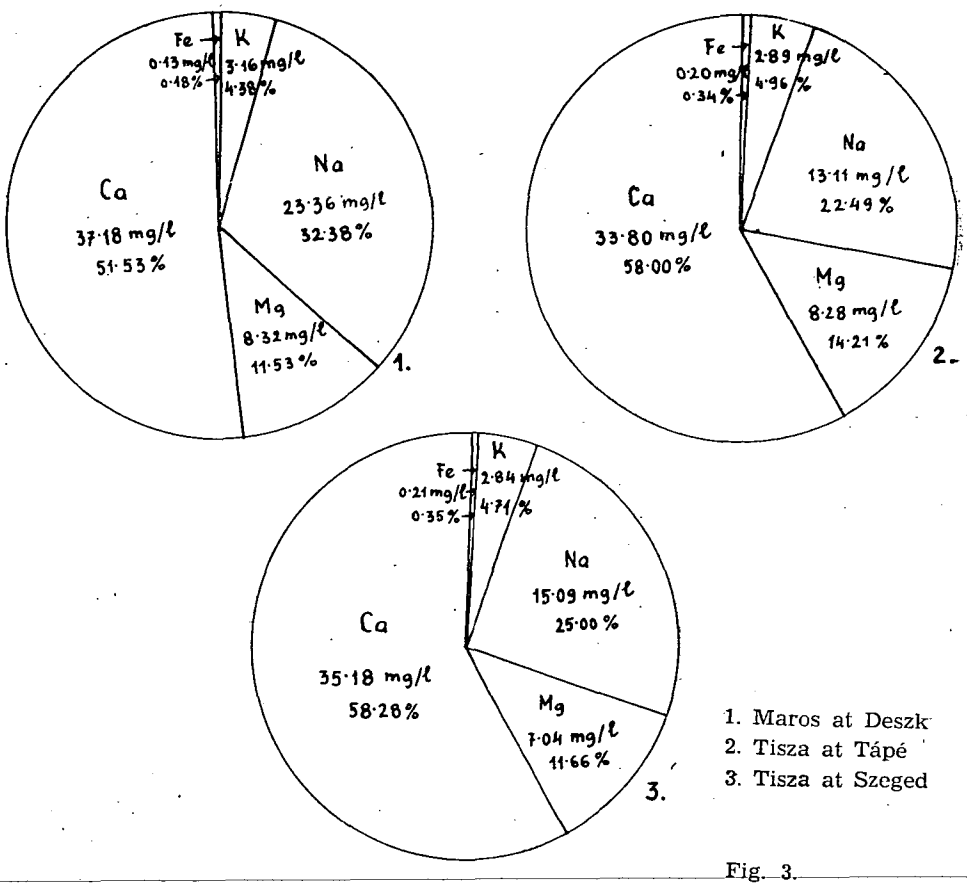
The oxygen value needed for the oxidation of the whole organic substance was less in the case of high water levels. In general it occurred in amounts of about 6 mg/l.

The free oxygen was determined once a month. The obtained values were always approximately the same 6—8 mg/l in both rivers. At low water temperatures the values were usually higher.

The free carbon dioxide content was estimated once a month at the site of the sampling. For the determination samples were taken vertically from three different depths: the bottom, the middle level and the surface. Our investigations showed that regularily the samples from the bottom taken along the current contained the least carbon dioxide, and those from the surface the most. On the other hand, in the case of the vertical ones not taken along the current the opposite could not always be proved. In the second half of June the Maros did not contain any. and the Tisza at Tápé and Szeged only very slight amounts of free carbon dioxide. In July and August it failed to occur in both rivers. The maximum free carbon dioxide content in the winter months was: at Tápé 8,80 mg/l in January, in the Maros 5,90 mg/l in February and at Szeged 7,00 mg/l in March.

From the analyses taken at all three sites of sampling the average value of the cations and anions was calculated both at high and low water levels. The values obtained were plotted on circular diagrams which also illustrate plausibly the difference between the Tisza and Maros and the influence exerted by the latter on the section of the Tisza at Szeged.

At high water levels at Tápé in the Tisza the calcium ion plays the most significant, the magnesium- and sodium ion a more subordinate role. The potassium ion amounts to hardly 5 per cent of the total cations, whereas the iron ion only occurs in quite insignificant amounts. Simultaneously in the Maros, in addition to the calcium ion, the sodium ion also plays an appreciable role, the magnesium- and potassium ions being present to the same extent as in the Tisza at Tápé. The amount of the iron ion is also in this case minimal. At the section of the Tisza at Szeged owing to the influence of the Tisza, the calcium ion can be found in large amounts, and as a result of that of the Maros the amount of the sodium ions also increases. (Fig. 3.)



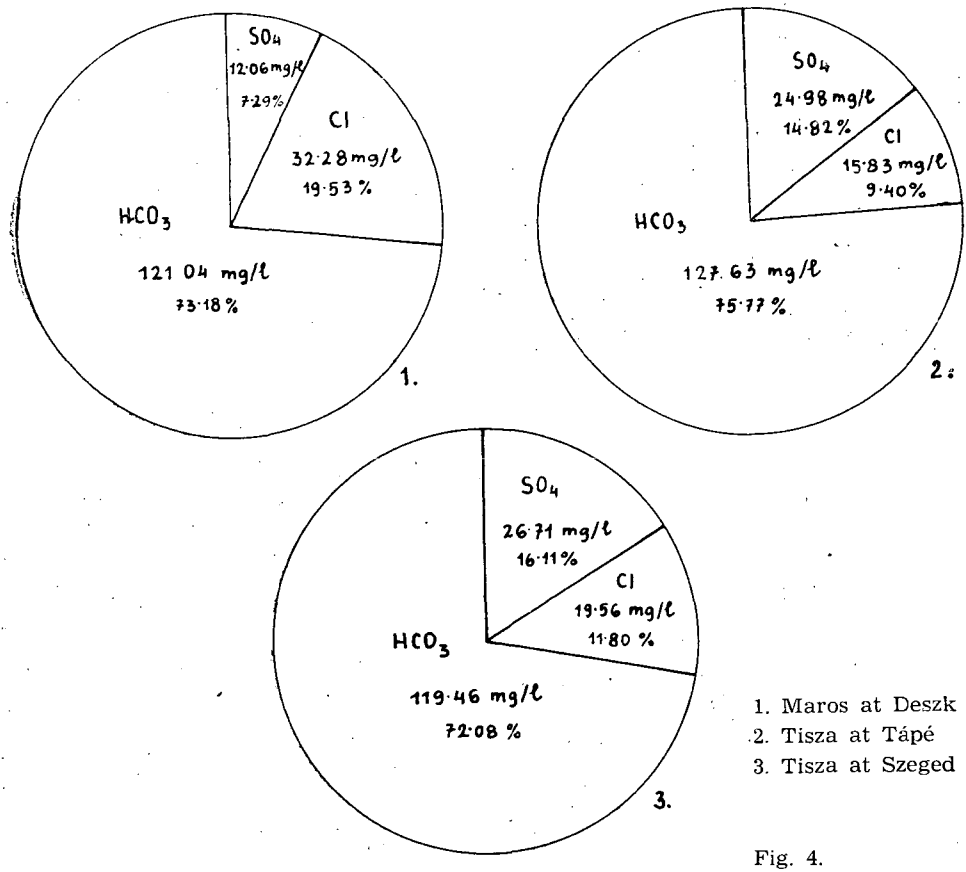
1. Maros at Deszk
2. Tisza at Tápé
3. Tisza at Szeged

Fig. 3.

The change of the anions is interesting too. In both rivers the hydrocarbonate anion dominates. In this section the change in amount of the chlorine- and sulphate ions characterises the rivers. In the Tisza at Tápé the amount of the sulphate ions present is one and a half times as much as of the chlorine ions, in the Maros on the other hand that of the chlorine ions is two and a half times that of the sulphate ions. At the section of the Tisza at Szeged the higher chlorine ion content of the Maros becomes distinctly conspicious. (Fig. 4.)

At low water levels the cation ratio remains about the same as it was at high water levels in both rivers. The only exception is the iron ion which failed to occur at low water levels in summer. A difference which can be detected between the high and low water levels is that as a consequence of the higher salt concentration the individual cations increase also quantitatively. (Fig. 5.)

In the case of the anions the hydrocarbonate ion also dominates, although in the Maros its amount calculated in per cents is ten per cent less. The change of the chlorine- and sulphate ions show the same regularities as recorded at high water levels. As the low water levels occur in summer the carbonate ion could naturally be found in both rivers in smaller or larger quantities. (Fig. 6.)



1. Maros at Deszk
2. Tisza at Tápé
3. Tisza at Szeged

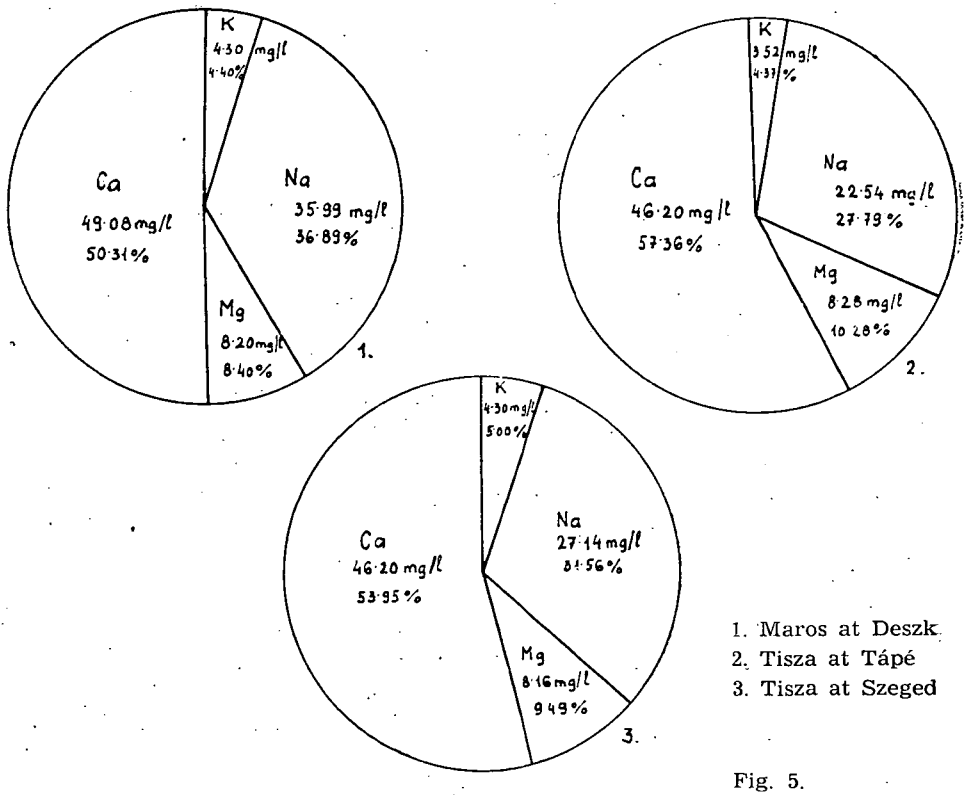
Fig. 4.

The chemical composition of the Tisza and Maros at high water levels was plotted in cation- and anion equivalent per cents on the triangular diagram suggested by Szádeczky. The Tisza can be plotted at Tápé at low water levels and at Szeged at both low and high water levels by means of straight lines running parallel, demonstrating that the ratio between the different cations and anions does not change at high and low water levels and that therefore the shift can only be quantitative. At high water levels owing

to the relatively higher chlorine content the Tisza at Tápé could be plotted with a curve running in a different direction. The Maros on the other hand, behaved differently at high than at low water levels. At high water levels the ratio of the sulphate-chlorine ion was 1 : 3, at low water levels it was approximately 1 : 2. In the case of the Maros therefore, not only the amount of the cations and anions changed, but their ratio too. (Fig. 7.)

Hence on the basis of our examinations the following establishments could be made:

The investigations of the dissolved salts also supports our previous statements, based on the examinations of the floating material, that the Tisza and Maros possess diverging characteristics.



1. Maros at Deszk
2. Tisza at Tápé
3. Tisza at Szeged

Fig. 5.

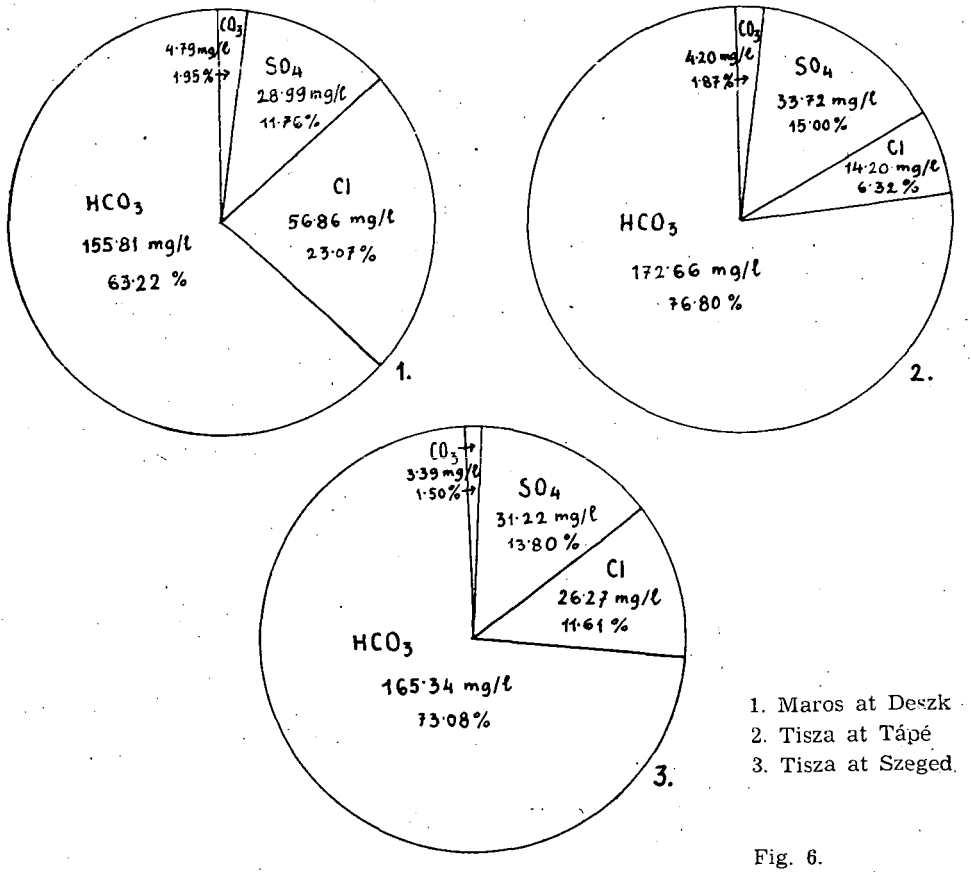
In the smaller water masses of the Maros the dissolved salt concentration is higher than in those of the Tisza at Tápé or Szeged.

The Maros always contains more sodium- and chloride ions than the Tisza proving that the dissolved salts of the Maros reach the mouth in spite of the fact that it deposits its floating material at Mezőség. The close correspondence of the equivalents of the sodium- and potassium-, as well as the chloride ions points to the fact that the sodium- and potassium ions contained in the Maros are primarily bound in the form of chloride and only to a smaller extent as sulphate. In the Tisza the sodium- and potassium ion con-

tent is lower. Here not only the chloride ions but the sulphate ones play a significant role. The sodium- and potassium ions are partly bound as chlorides and partly as sulphates.

Hydrocabonate ions do not occur in the Tisza or in the Maros bound to sodium ions as the total sum of calcium and magnesium ions exceeded in each case that of the hydrocarbonate- and carbonate ions.

The ratio of the alkalies showed the following figures: in the Tisza the sodium- and potassium ion ratio was 4,31 at high water levels, at low ones 6,40. Lithium occurred in slight traces, rubidium and caesium failed completely. In the Maros the sodium- and potassium ion ratio was to that of the Tisza showing merely a quantitative divergence which is a characteristic property of this river. The Maros contains more potassium ions than the Tisza



1. Maros at Deszk
2. Tisza at Tápé
3. Tisza at Szeged

Fig. 6.

at Tápé, however, as a result of the high sodium ion content the ratio was 7,02 at high water levels and 8,80 at low ones. Hence even the smaller value is higher than the sodium- and potassium ion ratio figure relating to the summer period of the Tisza. In the Maros lithium, rubidium and caesium failed completely. At Szeged the Tisza, as anticipated, illustrated the influence exerted by the Maros. At high water levels the sodium- and potassium ion ratio figure was 5,11, at low levels 6,37. Lithium, rubidium and caesium did not

occur. Minerals containing lithium could be found in the floating material of both the Maros and Tisza, owing to the prolonged time of transport it dissolved in the latter, whereas in the former the relatively short transport period, as well as the circumstances were not favourable for the dissolution.

The divergent characteristics of the two rivers could be observed too — if also not so distinctly — and magnesium ion relation. At high water levels at Tápé in the Tisza the ratio was 3,89 and 5,59 at low ones. Of the trace elements barium could be detected in very considerable amounts, stroncium to a lesser extent, whereas berillium failed to occur. In the Maros the ratio figure was 4,22 at high water levels and 5,99 at low ones. Spectroanalytical investigations also only demonstrated the occurrence of stroncium and barium, berillium could not either be detected by these means. At Szeged in the Tisza

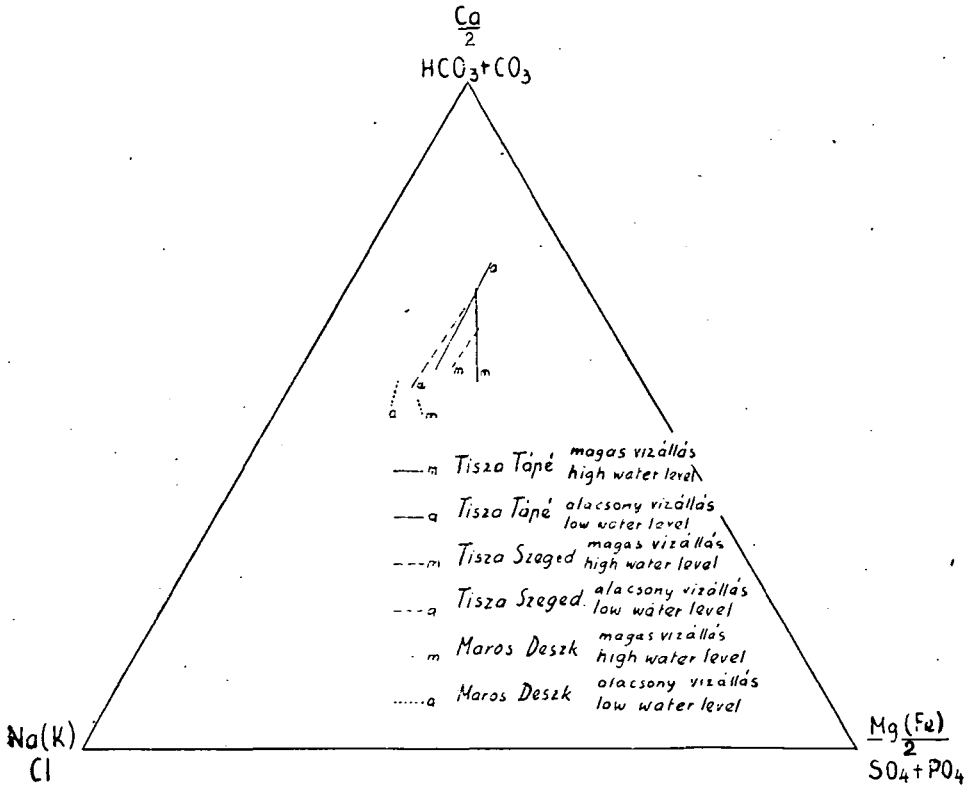


Fig. 7.

the ratio of the rare earth metals was as follows. At high water levels its ratio figure was like those quoted above lower, amounting to 4,84, at low levels it was 5,69. Of the trace elements stroncium showed a distinct band barium a less distinct one, berillium failed to occur.

Salts containing the cations enumerated above, and among the anions the chloride and sulphate anions dissolve readily, in the course of the transport they always remain in solution. At the convergence of different waters, at the most, their concentration changes. However, iron and manganese behave differently.

The precipitaion of iron, as has also been established by Szádeczky, starts at low pH values it is precipitated as $Fe(OH)_3$. $Fe(OH)_2$ can separate at pH 6 in the case of a low redoxy potential, at higher redoxy potentials it is converted into ferrous-ferric hydroxide, i. e. later into ferric hydroxide showing a red colour.

At surface decomposition manganese separates more readily than iron it turns into solid manganese dioxide, only going again into solution at relatively high pH values.

As in the Maros and the Tisza the pH values ranged always approximately at 7 it is comprehensible that they only contained slight amounts of dissolved manganese, which could only be demonstrated qualitatively. Owing to the fact that iron can only dissolve in the case of low redoxy potantials at pH values exceeding 6, it is natural that in both the Tisza and Maros it could be found in larger or smaller quantities.

The water of both rivers is often used for irrigation. Therefore the composition of the water of the rivers was also examined from this point of view. As mentioned above in the Tisza the sodium ions are mostly bound to sulphate and to a lesser extent to chloride, whereas the calcium- and magnesium ions are bound to hydrocarbonate and carbonate respectively.

The danger of the soil becoming saturated with soda has thus not to be taken into account. At the irrigation period the ratio prevailing between the rare earth metals and the alkaline metals is at least twofold. In the Maros the alkalies are in the first place bound to chloride and secondarily to sulphate. The greater part of the calcium- and magnesium ions is also bound to hydrocarbonate- and carbonate ions, respectively. The ratio between the rare earth metals and the alkaline metals is one and a half fold during the irrigation period, hence the water of the Maros seems also suitable for irrigation. Furthermore considering that the potassium ion content of the Maros is high at this period and that this element is an important factor from the point of view of cultivation, the water of the Maros is very appropriate for irrigation, nevertheless, the relatively low water content must be regarded as an inhibiting circumstance.

The floating material of the different water samples was separated by pipetting into 8 fractions. Fig. 8. illustrates the 8 fractions grouped for the sake of perspicuity in three parts. The first part contains the granules not exceeding 0,002 mm in diameter, the clayey fraction, the second part the fractions ranging between 0,002—0,0116 mm in diameter, the muddy fraction, and finally the third part the granules exceeding 0,016 mm in diameter, the sandy fraction.

Owing to the reasons mentioned above at the periods of high water levels the taking of water samples was discontinued at Tápé in the Tisza and at Deszk it the Maros, hence continuous examination could only be carried out from the section of the Tisza at Szeged.

Earlier statements that the amount of the floating material is also a function of the water level were supported. Changes diverging from this assumption — as also indicated in our previous examinations — are due to the changes of the weather.

At Tápé during the period of the investigations the amount of the floating material of the Tisza never attained the concentration of the water samples taken at Szeged or Deszk. The maximum fell into the period of the winter tide it was 580 mg/m^3 on February 25th. The fluctuations in concentration,

in the course of the first summer months, were not so much due to the water levels as rather to the weather conditions. The fluctuations of the concentration during the autumn indicated the different tide waves most appropriately. At this period the concentration hardly attained 500 g/m³. At low water levels in January and during the summer the sandy and muddy fractions were always larger.

The character of the floating material of the Maros also differs from that of the section of the Tisza above the point of convergence. At the investigations carried out in 1951 it could be established that at low water levels the sandy, at high water levels the muddy and clayey fractions dominate in the Maros. In the course of 1952, after the investigations had been in progress for two years, this fact was again proved although the water level conditions were quite different from those of the previous year. In 1951 after the flowing down of the spring high water the water levels of the Tisza and Maros remained low the whole year round, whereas in 1952 after the running down of the spring tides the low water level lasted for a relatively short period in the summer and after the autumn rains both rivers overflowed to such an extent that the levels approached the high values of the spring. The granular composition of the floating material of the Maros usually conformed the whole year round to the changes of the tide. The concentration fluctuations of the Maros ranged between far greater limits than those of the Tisza at Tápé. Save for a few exceptions the end of June and the beginning of July they were also related to the changes of the water levels. During the above periods the spring tide of the Maros was running down, and in spite of this fact the amount of the floating material was 740 g/m³. This fact should also be attributed to the changes of the weather. The maximum fell into the high water levels of the spring, the concentration amounted to 1140 g/m³ when it was measured at the end of March.

In the course of the winter when low water levels prevailed for several months the sandy fraction of the floating material dominated in the section of the Tisza at Szeged. In addition smaller amounts of muddy portions and very slight quantities of clayey ones could also be found. During the spring tides the muddy and clayey fractions increased consequently after the flowing down of the tide the sandy fraction became less important in comparison to the significantly increased amount of the muddy fractions, thus showing the true character of the river. Owing to the joining of the two rivers the amount of floating material ranged within wide limits compared with the changes in concentration of the Tisza at Tápé. The maximum set in suddenly with the spring floods on April 1st amounting to 1580 g/m³. During the permament low water levels the amount of floating material had a similar concentration to that found at Tápé, at this period the domination of the sandy fraction could not be observed.

Thus the finer fractions were present in both rivers at high water levels. This can be accounted for by the fact that during these periods the rivers stirred up the muddy and clayey portions occurring in larger amounts on the flooded area. At low water levels on the other hand, when the fall of the rivers is relatively greater, a comparatively small fraction of clayey and muddy portions obtained access to the alredy formed river bed thus their amount diminished appreciably, whereas owing to the greater fall the rivers were capable of carrying off part of the coarser silt.

The floating material of all three sampling sites was separated into 8 fractions by means of pipetting. These were averaged at high- and low water levels. The results obtained were plotted in a sum-curve on the basis of which the following could be established.

At high water levels the sum-curve demonstrating the section of the Tisza at the convergence point can be well differenciated from the one illustrating the Maros, the two curves run almost parallel showing the different characteristics of the two rivers, i. e. the coarser granule composition of the floating material of the Maros. The sum-curve of the section of the Tisza at Szeged reflects truly the influence of the Maros, consequently its sum-curve ranges between the two previous ones. (Fig. 9.)

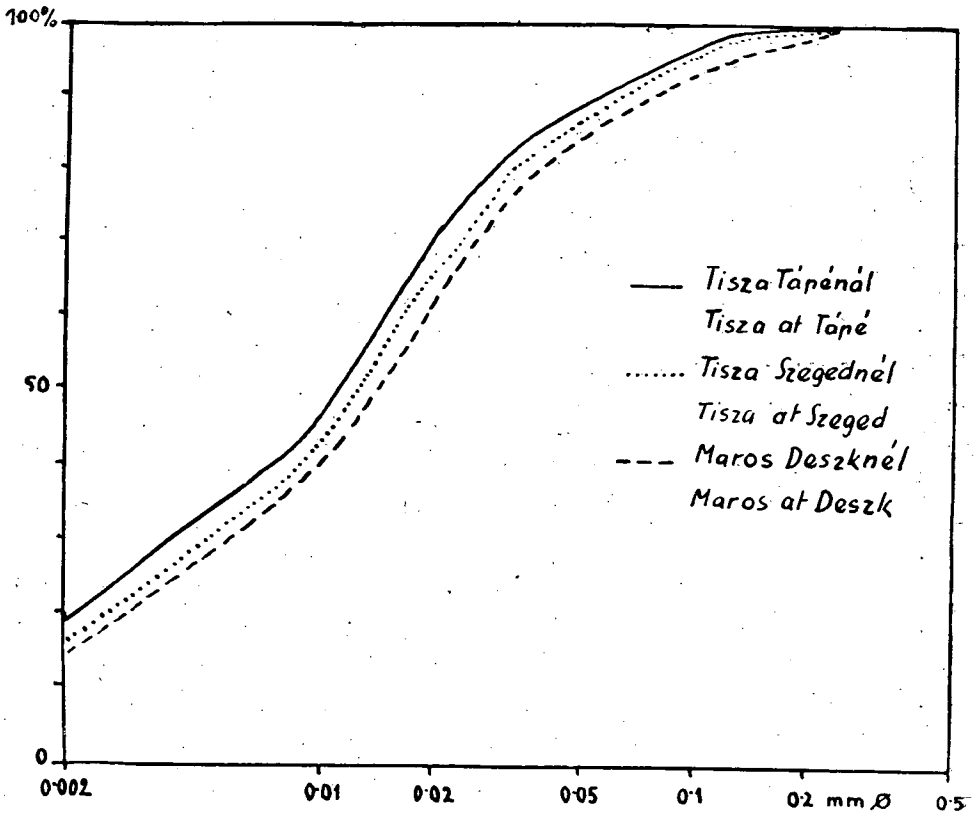


Fig. 9

At low water levels the sum-curve of the Tisza at Tápé shows that the muddy fraction is dominating, whereas in the case of the Maros the sandy fraction is more significant consequently the two curves intersect at this point. At the section of the Tisza at Szeged the sum-curve shows an almost parallel course to that illustrating the muddy and finer sandy fractions of the Maros, as a great part of the coarser sandy portion is deposited directly in the vicinity of the mouth the two curves approach closely at this section showing clearly the influence of the Maros. (Fig. 10.)

The mineral residue of the floating material of the Tisza diverges from the mineral species which can be found in the floating material of the Maros. Inasmuch as among the feldspars of the Tisza zonal plagioclases also occur abundantly, i.-e. fragments originating from the tertiär vulcanic region; whereas in the Maros, as already indicated in our previous investigations, the fragments originating from the andesite region of Transylvania do not reach the lower section. Garnet can only very rarely be found in the Tisza, whereas in the floating material of the Maros it occurs fairly frequently. The relatively large amount of idiomorphous zircon granules which can be found in the Tisza is striking, in the Maros this mineral plays only a subordinate role. In the Tisza, particularly at low water levels, considerable quantities of iron

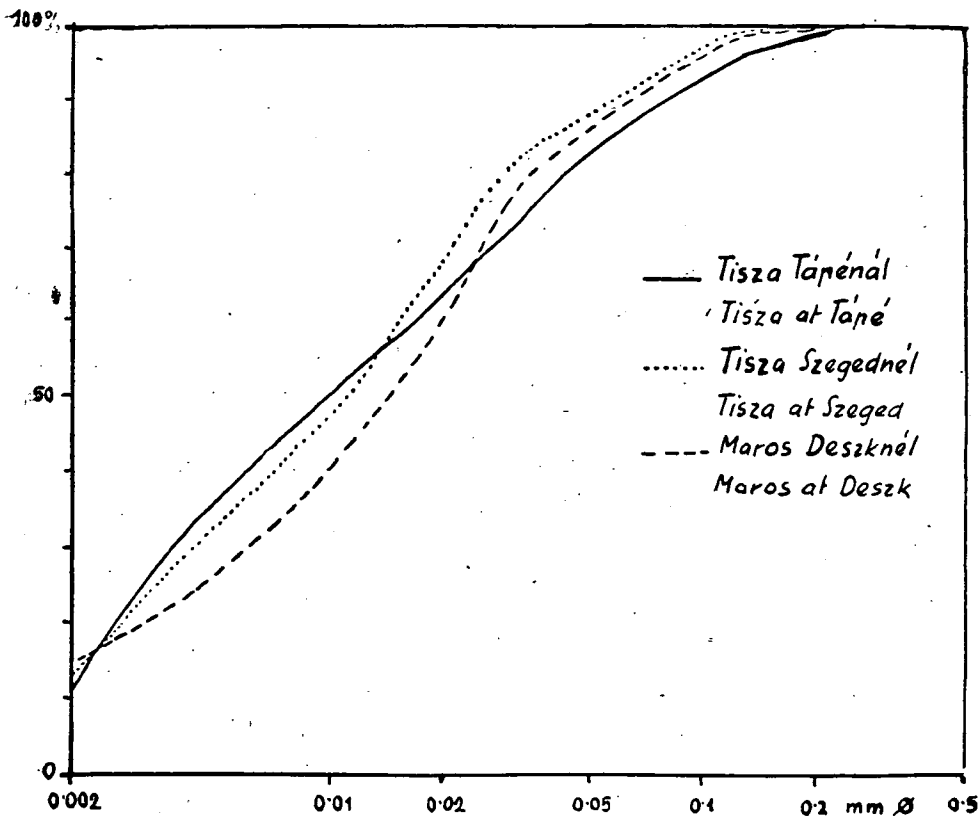


Fig. 10.

ores (magnetite, limonite) can be found. Among micas in addition to muscovite and biotite, chlorite also played a significant role.

Turmaline is a mineral rather characteristic for the Maros.

The amount of the floating material and dissolved salts of the Tisza and Maros were averaged from the samples taken in the course of the year, the following values were obtained: For sake of comparison the results measured in the Maros in 1951 are also reported.

	floating material		dissolved salts	
	1951	1952	1951	1952
Tisza at Tápé	—	0,233	0,220 g/l	0,214 g/l
Tisza at Szeged	—	0,208 g/l	0,233	0,226
Maros at Deszk	0,420	0,246	0,280	0,280

It could be established that concerning the quantity of the dissolved salts there is no essential divergence between the two years, although the weather- and water level conditions varied completely. In contrast to these findings the change in the amount of the floating material was all the more striking indicating that the amount of the floating material is in close correlation with the weather conditions and water levels.

SUMMARY

The quantitative change of the dissolved salts is usually a function of the water level. The change in the amount of the calcium-, sodium-, potassium-, chloride-, hydrocarbonate ions is reversibly proportional. The magnesium-, sulphate- and phosphate ions are not very sensitive to changes of the water levels.

The concentration of the dissolved salt of the Maros is always higher than that of the Tisza.

In the Maros the higher sodium- and potassium content is primarily bound to the chloride ion, in the Tisza this is not only valid for the chloride ion but also for the sulphate ion. Hydrocarbonate ions are not bound in the Tisza or in the Maros bound to sodium ions, thus if the water of the rivers is used for irrigation the danger of the soil being saturated with soda must not be taken into account.

Of the trace elements lithium can be detected in slight traces in the Tisza at Tápé, whilst in the section of the Tisza at Szeged and in the Maros it failed to occur. Rubidium and caesium could not either be found in any of the three sampling sites. The Tisza at Tápé contains significant amounts of barium at the other two sampling sites it only occurred in insignificant quantities associated with strontium. Beryllium did not occur in either river.

Concerning the granular composition of the floating material the previous establishment holds good that corresponding to the characteristic of the section of the river the finer fraction dominates at high water levels and the coarser one at lower ones.

The sum-curve composed of the mean values of the individual fractions of the floating material at low and high water levels, demonstrates this characteristic convincingly.

The zonal plagioclases are characteristic components of the floating material of the Tisza, they do not occur in the Maros. The relatively large amount of zircon crystals contained in the Tisza is striking. Turmaline is a rather characteristic mineral of the Maros.

The Maros deposites a considerable part of its floating material originating in the andesite district in the Mezőség, its dissolved salts, however, proceed to the mouth

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ИССЛЕДОВАНИЕ МАТЕРИАЛА, НЕСЕННОГО ТИССЕЙ И МАРОШЕМ В РАСТВОРЁННОМ СОСТОЯНИИ.

— ИОСИФ МЕЗЭШИ И ЭВА ДОНАТ —

Количественные изменения растворенных солей, как правило, находятся в зависимости от горизонта воды. Горизонтам воды обратно пропорциональны изменения количеств ионов кальция, натрия, калия, хлорида и гидрокарбоната и прямо пропорционально изменение количества ионов железа. Ионы сульфата, фосфата и магнезия к изменениям горизонта воды не чувствительны.

В реке Марош более высокие количества натрия и калия обусловлены хлористым ионом, а в Тиссе играет роль, кроме хлористого иона, и сульфатион.

Количество гидрокарбоната ни в Тиссе, ни в Мароше ионом натрия не обусловливается:

Из элементов, присутствующих в следах, появляются на участке Тиссы при Тапэ барий, литий и стронций, а в Мароше только стронций.

Соответственно секционному характеру обоих рек, при высоком уровне воды преобладающая фракция — более мелкая, а в низком — более грубая, в взвешенных наносах.

Для минеральных компонентов материала взвешенных наносов характерны зонные плагиоклазы, отсутствующие в Мароше.

Table 2.

Szeged	dissolved salts	alkalinity	variable hardness	total hardness	Ca-ion	Mg-ion	Na-ion	K-ion	R_2O_3	iron	manga-nese	HCO_3-ion	CO_3-ion	Cl-ion	SO_4-ion	PO_4-ion	SiO_2	insoluble residue	organic matter	free oxygen	free CO_2
I. 30.	0,13	2,51	5,12	8,46	45,93	9,32	20,01	3 89	—	0,05	—	153,13	—	34,00	34,20	0,06	6,40	4,00	6,68	—	6,70
I. 28.	0,13	2,06	5,78	6,99	36,14	8,43	15,59	3,44	6,80	0,08	—	125,68	—	19,50	34,14	0,05	12,00	3,20	8,82	8,86	5,90
III. 5.	0,29	2,13	5,97	7,20	36,93	8,85	19,23	3,10	9,00	—	—	129,95	—	25,80	33,40	—	2,80	12,40	2,93	—	—
III. 12.	0,38	2,61	7,31	8,00	44,90	9,61	21,90	4,32	18,40	—	—	159,24	—	35,10	35,29	—	9,80	3,40	4,74	—	—
III. 19.	0,13	2,67	7,48	8,54	44,90	10,58	24,72	7,28	2,60	—	ny	162,89	—	38,40	29,53	0,18	7,40	6,00	2,50	—	—
III. 26.	0,30	2,36	6,61	7,86	44,90	8,70	23,66	3,81	6,20	0,22	—	143,98	—	38,50	30,72	0,05	7,20	5,00	2,15	7,78	7,00
IV. 2.	0,31	2,17	6,08	7,79	42,31	8,15	15,96	3,89	7,80	0,14	—	132,39	—	19.50	38,00	—	9,80	8,80	3,31	—	—
IV. 6.	0,29	1,84	5,12	6,55	35,34	7,00	10,36	2,82	6,80	0,63	—	112,26	—	11,40	23,00	—	13,80	4,40	2,36	—	—
IV. 12.	0,18	1.64	4,60	6,13	30,44	8,14	—	—	6,60	0,29	—	100,06	—	11,50	29,90	—	8,50	8,20	4,82	—	—
IV. 21.	0,24	1,63	4,57	6,12	32,07	7,14	9,79	3,10	6,10	0,26	—	99,45	—	12,50	22,29	0,12	7,00	13,10	2,30	—	—
IV. 28.	0,28	1,63	4,57	5,95	31,58	6,66	13,26	2,00	6,20	0,11	—	100,06	—	18,30	16,60	0,02	9,50	2,30	2,03	6,95	3,00
V. 5.	0,20	1,64	4,60	5,54	30,17	5,76	11,02	1,97	4,60	0 92	—	100,06	—	21,60	20,22	—	8,40	2,00	3,96	—	—
V. 14.	0,36	1,82	5,09	6,16	34,36	5,89	16,31	3,44	5,40	0,14	—	111,04	—	17,40	31,02	—	17,00	4,10	3,44	—	—
V. 21.	0,25	1,84	5,15	6,49	37,63	6,34	8,33	1,81	5,60	0,13	—	112,26	—	11,80	27,88	—	7,40	3,50	3,92	—	—
V. 28.	0,22	2,05	5,74	6,97	39,09	8,01	11,29	1,83	5,00	0,14	—	125,07	—	19,40	26,57	—	9,60	4,40	3,07	6,22	4,40
VI. 4.	0,18	2,34	6,56	7,77	41,44	8,58	15,04	3,65	3,80	0,16	—	142,76	—	24.40	31,70	—	8,60	1,10	7,75	—	—
VI. 11.	0,16	1,99	5,58	7,08	35,75	9,06	21,28	2,68	3,00	0,04	—	121,39	—	30,50	26,80	—	6,00	3,60	8,51	—	—
VI. 18.	0,19	2,23	6,24	7,89	39,99	10,03	21,16	3,05	3,10	0,07	—	136,03	—	29,75	33,00	—	7,30	2,00	6,44	6,50	6,02
VI. 25.	0,25	1,97	5,52	5,70	37,40	4,68	16,99	1,89	4,40	0,15	ny	120,17	4,08	20 95	24,66	—	11,00	—	4,34	—	—
VII. 2.	0,14	2,08	5,82	5,21	32,90	8,75	20,73	4,04	3,20	0,11	—	126,88	—	29,50	22,03	—	8,60	2,30	4,21	—	—
VII. 9.	0,23	2,23	6,24	8,06	39,04	11,32	18,80	3.79	3,50	0,16	—	138,47	3,06	25,30	30,62	—	8,70	5,90	2,42	—	—
VII. 16.	0,21	2,60	7,27	8,69	45,50	10,12	24,93	6,72	—	0,22	—	160,43	1,08	39,40	33,20	—	6,20	2,30	6,66	7,11	—
VII. 23.	0,22	2,32	6,49	9,26	46,60	11,92	25,81	4,61	6,50	0,37	ny	148,02	14,07	47,20	30,60	—	4,00	7,00	7,08	—	—
VII. 30.	0,31	3,01	8,42	10,89	56,10	13,24	21,96	3,87	6,00	0,04	—	183,43	7,99	27,60	36,66	—	11,90	3,00	6,20	—	—
VIII. 6.	0,26	2,86	8,01	8,93	50.60	8,09	28,79	3,84	1,80	0,08	—	174,46	3,03	25,98	34,52	—	7,60	2,20	4,50	—	—
VIII. 13.	0,27	2,91	8,15	9,06	52,60	8.60	30,26	3,56	0,80	0,10	—	177,51	9,30	27,77	34,20	—	7,90	1,70	4,20	—	—
VIII. 19.	0,26	3,27	9,16	7,57	41,55	7,67	33,91	6,16	3,00	0,06	—	161,95	4,94	27,13	34,20	—	7,00	3,80	4,40	—	—
VIII. 27.	0,32	3,32	9,29	8,74	51,90	6,47	28,58	3,22	0,90	0,06	—	185,31	2,21	23,99	34,20	—	9,00	—	5,50	10,40	—
IX. 3.	0,33	3,60	10,08	9,71	56,99	7,59	32,69	4,38	4,70	0,09	—	201,91	—	24,60	34,40	0,01	7,50	5,30	6,42	—	—
IX. 10.	0,45	3,44	9,63	9,49	58,70	5,54	35,58	5,23	5,50	0,06	—	197,50	1,91	24,20	34,50	0,02	7,70	1,20	4,38	—	—
IX. 17.	0,30	3,33	9,32	8,51	50,90	6,07	33,52	3,93	4,30	0,06	—	186,05	0,85	22,30	33,80	0,06	6,60	2,00	5,17	—	—
IX. 24.	0,30	3,06	8,57	9,52	49,60	12,10	26,70	4,86	5,40	0,07	—	186,66	1,09	23,30	32,80	0,03	3,70	3,30	6,88	—	—
X. 1.	0,27	2,69	7,53	7,90	45,72	4,22	27,64	4,38	1,40	0,10	(ny)	164,09	—	21,40	26,80	0,07	6,30	3,00	4,08	6,76	4,45
X. 8.	0,29	1,94	5,43	6,17	33,27	6,63	12,92	2,66	4,90	0,35	—	118,34	—	10,40	23,20	0,02	6,80	6,80	4,60	—	—
X. 15.	0,25	2,11	5,91	5,91	33,42	5,36	25,43	3,02	4,30	0,05	—	128,71	—	19,30	21,20	—	4,40	4,40	2,93	—	—
X. 22.	0,30	2,18	6,10	6,84	37,27	7,11	18,02	3,28	6,80	0,08	—	132,98	—	22,00	26,20	0,02	10,10	5,00	4,05	—	—
X. 29.	0,14	1,65	4,62	5,37	29,30	5,53	10,07	2,83	3,60	0,18	—	102,48	—	14,40	20,49	0,05	8,50	4,20	4,78	2,12	—
XI. 4.	0,14	1,64	4,60	5,07	27,67	5,23	11,49	1,10	1,40	0,29	—	100,04	—	13,60	17,30	0,01	9,00	6,80	4,46	—	—
XI. 12.	0,11	1,83	5,12	5,54	30,20	5,77	12,94	3,52	2,90	0,19	—	111,63	—	15,25	20,70	0,01	6,50	0,60	2,94	—	—
XI. 19.	0,12	1,44	4,03	4,76	24,58	5,10	12,67	1,63	3,04	0,26	—	87,84	—	14,90	17,00	0,01	12,20	3,10	3,27	—	—
XI. 28.	0,17	1,74	4,87	5,66	33,66	4,13	9,40	1,99	8,71	0,14	—	106,14	—	10,90	22,52	0.02	10,10	5,60	3,92	—	—
XII. 3.	0,22	1,79	5,01	5,54	33,51	3,71	10,78	1,66	8,56	0,08	—	109,18	—	12,20	21,04	0,02	11,30	0,90	3,55	—	—
XII. 9.	0,15	1,66	4,65	4,94	30,24	3,28	9,95	2,62	7,57	0,33	—	101,26	—	10,89	18,60	0,02	5,80	1,30	3,67	—	—
XII. 18.	0,15	2,07	5,80	6.69	37,04	7,23	14,50	2,54	11,43	0,03	—	126,27	—	15,70	30,08	0,01	8,30	0,20	3,50	—	—
XII. 22.	0,20	1,69	4,73	5,07	28,81	6,26	9,61	1,55	5,77	0,35	—	103,99	—	8,10	23,18	0,01	5,60	12,40	3,86	—	—
XII. 30.	0,14	1,66	4,65	5,91	26,96	7,78	8,58	2,52	6,61	0,33	—	101,26	—	7,30	25,15	0,01	5,40	5,90	3,59	—	—

Table 1.

Tápé	dissolved salts	alkalinity	variable hardness	total hardness	Ca-ion	Mg-ion	Na-ion	K-ion	R_2O_3	iron	manga-nese	HCO_3-ion	CO_3-ion	Cl-ion	SO_4-ion	PO_4-ion	SiO_2	insoluble residue	organic matter	free oxygen	free CO_2
I. 28.	0,11	2,63	7,36	7,57	41,15	7,88	19,93	3,91	11,20	0,08	ny	160,14	—	14.90	34,30	0,11	7,20	3,60	10,41	7,63	8,80
II. 25.	0,11	2,01	5,63	5,72	27,00	7,49	12,04	3,33	10,00	0,32	ny	122,85	—	9.50	26,47	0,12	12,40	3,20	6,24	7,41	21,50
III. 3.	0,11	2,30	6,43	6,96	31,81	10,94	15,54	4,18	7,20	—	—	139,99	—	14,40	30,68	0,14	11,80	5,00	2,37	—	—
III. 10.	0,13	2,32	6,48	7,51	37,68	9,67	19,55	3,98	6,00	—	—	141,24	—	27,20	35,50	—	10,40	5,40	2,72	—	—
III. 17.	0,11	2,88	8,05	9,53	47,56	12,54	18,01	5,42	3,10	—	(ny)	175,44	—	26,50	41,10	—	5,80	7,60	10,21	—	—
III. 24.	0,26	2,46	6,88	9,37	40,14	16,37	9,64	2.51	2,40	0,08	—	149,96	—	23,20	35,51	—	6,80	6,40	2,50	6,84	4,80
III. 31.	0,20	2,18	6,12	6,43	29,48	10,09	13,08	4,88	13,20	—	—	133,22	—	14,40	19,73	0,14	11,20	20,00	3,05	—	—
V. 12.	0,19	2,18	6,10	5,99	34,85	6,06	13,22	2,09	5,10	0,07	—	132,92	—	11,00	23,18	—	5,20	3,40	3,16	—	—
V. 19.	0,15	2,19	6,13	6,73	39,08	6,94	12,76	2,71	5,80	0,31	—	116,57	—	17,19	27,45	—	10,40	5,00	3,98	—	—
V. 26.	0,19	2,22	6,20	6,93	37,57	7,34	14,83	3,98	5,20	0,34	—	135,12	—	17,40	28,10	0,12	9,00	2,40	4,01	5,72	7,70
VI. 2.	0,21	2,41	6,76	8,36	42,79	10,33	15,19	2,88	5,60	0,22	—	147,19	—	19,30	31,89	—	4,80	6.40	5,12	—	—
VI. 9.	0,16	2,45	6,85	7,70	36,08	11,37	20,73	3,98	2,60	0,06	—	149,45	—	23,20	30,74	—	4,20	3,90	4,23	—	—
VI. 16.	0,27	1,66	4,65	5,44	30,70	6,69	24,23	4,09	2,60	0,03	—	101,26	—	46,85	23,67	—	7,60	4,30	5,82	6,77	3,58
VI. 23.	0,12	2,13	5,96	6,65	33,95	8,27	14,51	3,36	3,20	0,21	—	123,83	1,80	22,90	24,66	—	6,20	1,40	4,02	—	—
VI. 30.	0,16	2,10	5,89	7,60	39,40	9,12	11,61	3,19	2,80	0,07	(ny)	113,46	4,80	17,35	21,37	—	7,60	2,40	2,86	—	—
VII. 7.	0,18	2,24	6,27	6,90	29,80	11,49	17,10	3,53	2,70	0,06	—	136,64	3,60	18,40	26,96	—	6,60	6,00	2,42	—	—
VII. 14.	0,37	1,74	4,87	6,27	27,74	10,03	30,23	4,01	3,40	0,04	—	102,48	1,80	50,60	26,14	—	11,80	3,40	5,14	7,86	—
VII. 21.	0,24	2,95	8,26	9,47	47,29	12,44	23,05	6,92	3,80	0,16	(ny)	179,05	7,80	26,00	31,56	—	6,50	3,70	6,47	—	—
VII. 28.	0,29	3,26	9,13	10,74	56,10	13,24	21,96	3,87	2,00	0,08	—	198,86	11,18	10,83	41,59	—	9,70	2,90	3,90	—	—
VIII. 4.	0,36	3,37	9,44	7,44	52,60	0,36	30,32	3,08	1,60	0,09	—	205,57	4,94	15,82	35,51	—	9,90	2,10	3,50	—	—
VIII. 11.	0,44	3,38	9,46	9,00	51,95	7,54	26,51	3,36	2,80	0,06	—	193,37	6,30	10,62	38,31	—	5,50	3,80	4,30	—	—
VIII. 18.	0,30	3,37	9,44	8,72	49,70	7,72	24,52	4,69	2,80	0,05	—	178,41	5,48	14,01	36,99	—	6,90	1,10	4,90	—	—
VIII. 25.	0,26	3,51	9,83	9,74	52,30	10,07	23,78	3,65	1,90	0,08	—	202,52	5,21	9,44	40,11	—	6,70	1,10	4,20	9,38	—
IX. 1.	0,28	3,32	9,30	9,52	55,60	7,59	24,12	4,01	6,50	0,02	—	202,52	0,55	9,60	36,80	0,01	8,70	2,40	5,95	—	—
IX. 8.	0,38	3,87	10,84	9,28	55,50	6,63	32,35	3,76	6,00	0,02	—	201,30	0,55	12,58	36,20	0,01	6,00	1,60	4,47	—	—
IX. 15.	0,31	3,64	10,19	8,72	51,45	6.63	26,59	4,46	5,10	0,02	—	185,47	1,12	10,80	35,20	0,04	6,40	1,20	4,99	—	—
IX. 22.	0,33	2,84	7,95	7,49	38,34	9,30	23,90	1,07	—	0,08	—	163,24	2,21	9,20	36,40	0,05	4,60	2,20	5,19	—	—
IX. 29.	0,39	2,89	8,09	8,15	51,50	4,16	22,02	3,84	—	0,16	—	176,29	—	11,30	36,40	0,01	7,00	3,20	5,38	10,31	5,08
X. 6.	0,34	2,47	6,91	7,02	44,84	4,16	8,97	2,71	2,00	0,22	—	150,67	—	2,10	19,60	0,01	12,00	5,20	2,91	—	—
X. 13.	0,29	1,90	5,32	5,88	31,07	4,22	10,41	3,06	8,80	0,31	—	115,90	—	2,60	24,00	0,01	6,00	7,20	2,39	—	—
X. 20.	0,22	2,28	6,38	7,01	37,39	7,78	11,68	3,08	1,80	0,12	—	139,08	—	14,10	22,40	0,02	7,80	4,60	4,54	—	—
X. 27.	0,16	1,91	5,35	6,15	32,29	7,11	8,93	3,19	4,80	0,17	—	116,57	—	10,34	22,61	0,01	6,90	7,90	4,68	10,02	—
XI. 3.	0,10	1,82	5,09	4,83	26,50	4,92	7,18	1,44	5,00	0,32	—	111,02	—	6,30	17,70	0,01	12,00	4,50	4,26	—	—
XI. 11.	0,15	1,81	5,07	5,36	28,14	6,26	6,25	2,60	5,20	0,26	—	110,41	—	8,40	10,70	0,01	10,00	2,80	3,80	—	—
XI. 17.	0,15	1,84	5,15	5,70	29,12	7,11	10,74	1,16	2,40	0,21	—	112,24	—	10,80	19,30	0,01	8,70	2,60	3,44	—	—
XI. 26.	0,13	1,81	5,07	5,15	26,70	7,24	9,21	1,75	7,78	0,28	—	110,96	—	6,30	16,60	0,02	7,30	9,80	4,19	—	—
XII. 1.	0,13	1,74	4,87	5,24	—	—	7,24	2,34	10,25	0,18	—	106,14	—	5,80	21,54	0,01	9,60	4,00	3,75	—	—
XII. 8.	0,14	1,72	4,82	5,07	27,12	6,62	8,24	2,29	6,59	0,32	—	104,92	—	6,70	18,91	0,01	2,80	13,10	3,07	—	—
XII. 16.	0,17	1,86	5,21	5,61	32,18	4,87	10,95	1,19	8,74	0,07	—	113,46	—	8,70	23,34	0,01	10,40	2,00	4,38	—	—
XII. 22.	0,18	1,89	5,29	5,91	32,82	5,78	9,40	2,15	12,47	0,57	—	115,30	—	7,70	20,55	0,01	7,00	11,00	3,18	—	—
XII. 30.	0,24	1,76	4,93	5,66	28,07	8,21	7,71	2,67	8,29	0,46	—	107,36	—	7,02	21,37	0,01	4,20	13,40	3,51	—	—

Table 3.

Maros	dissolved salts	alkalinity	variable hardness	total hardness	Ga-ion	Mg-ion	Na-ion	K-ion	R_2O_3	iron	manga-nese	HCO_3-ion	CO_3-ion	Cl-ion	SO_4-ion	PO_4-ion	SiO_2	insoluble residue	organic matter	free oxygen	free CO_2
II. 2.	0,17	2,20	6,17	7,39	39,98	7,63	38,80	2,77	5,40	0,14	—	134,47	—	70,70	11,51	0,03	12,00	5,80	6,26	7,01	3,80
II. 29.	0,16	2,27	6,37	8,71	40,81	13,06	27,82	3,91	17,20	0,26	—	138,78	—	49,50	35,84	0,24	12,80	5,60	8,18	7,56	5,90
III. 7.	0,33	2,31	6,47	10,06	55,99	9,73	36,80	4,54	9,60	—	—	141,15	—	66,60	43,03	0,07	6,80	4,80	2,34	—	—
III. 14.	0,36	2,60	7,29	11,00	58,43	12,28	40,84	1,88	—	—	—	158,78	—	66,50	60,17	—	8,00	6,80	7,75	—	—
III. 21.	0,17	2,36	6,62	9,97	49,02	11,73	39,58	4,40	4,60	—	ny	156,40	—	68,10	45,70	—	8,00	5,60	2,10	—	—
III. 28.	0,28	2,12	5,95	5,60	27,65	7,53	—	—	8,00	0,04	—	129,56	—	42,80	35,20	—	10,60	6,40	—	6,94	—
IV. 24.	0,14	1,64	4,60	6,02	32,95	6,14	10,32	3,02	6,40	0,26	—	100,22	—	13,35	24,49	—	20,99	3,80	6,07	—	—
V. 16.	0,28	1,64	4,60	6,19	27,72	10,06	16,09	3,73	5,40	0,11	—	100,22	—	28,10	23,37	—	23,30	2,20	3,79	—	—
V. 23.	0,25	1,70	4,76	7,19	35,50	9,70	14,68	3,67	7,30	0,37	—	103,76	—	31,30	32,22	—	19,60	4,30	4,26	—	—
V. 30.	0,24	1,76	4,93	7,01	37,52	7,67	14,81	4,06	4,80	0,07	—	107,30	—	32,60	28,44	0,32	19,98	2,00	2,88	6,08	3,80
VI. 6.	0,39	1,62	4,54	6,65	32,94	8,79	14,86	3,22	5,40	0,09	—	98,82	—	36,60	26,63	—	9,80	2,10	5,41	—	—
VI. 13.	0,25	2,28	6,38	6,83	31,30	10,70	18,88	3,67	3,30	0,10	—	120,78	5,07	22,40	29,59	—	5,30	2,80	6.75	—	—
VI. 20.	0,25	1,97	5,52	6,82	36,40	7,54	30,61	4,72	3,90	0,06	—	120,17	3,30	46,35	25,04	—	10,30	3,90	5.33	—	—
VI. 27.	0,23	1,75	4,90	6,77	36,25	7,42	21,90	2,85	2,90	0,07	(ny)	106,75	—	48,25	16,44	—	8,30	2,10	4,26	—	—
VII. 4.	0,27	2,14	5,99	7,96	40,99	9,73	35,61	3,61	2,40	0,03	—	130,54	—	51,30	29,43	—	13,50	2,00	3,46	—	—
VII. 11.	0,26	2,69	7.53	8,51	31,02	19,06	16,48	4,52	2,50	0,07	—	158,60	3,60	23,40	29,26	—	7,20	2,30	8,32	—	—
VII. 18.	0,31	2,35	6.58	9,13	47,64	10.76	35,42	5,34	2,40	0,07	—	123,83	1,20	79,50	28,77	—	10,00	2,20	7,62	7,15	—
VII. 25.	0,31	2,15	6,03	9,22	49,25	10,15	37,94	4,07	2,70	0,38	(ny)	99,55	1,80	78,10	30,41	—	7,80	5,20	15,23	—	—
VIII. 1.	0,38	1,91	5,35	8,85	47,90	9.36	28,27	4,67	1,70	0,09	—	160,06	1,39	52,80	25,48	—	9,90	2,80	4,70	—	—
VIII. 8.	0,37	2,33	6,52	9,06	47,85	8.21	32,59	4,24	2,30	0,08	—	142,61	—	55,67	28,77	—	15,60	2,00	4,40	—	—
VIII. 15.	0,38	2,51	7,03	8,18	48,30	6.19	38,51	3,81	2,10	0,00	—	153,11	—	58,90	26,80	—	12.10	3,70	5,50	—	—
VIII. 22.	0,39	2,49	6,97	8,13	49,01	5.53	36,84	4,01	0,70	0,03	—	151,89	—	52,80	24,50	0,01	11,60	6,40	3,50	—	—
VIII. 29.	0,36	2,65	7,42	9,41	58,30	5.47	41,53	4,92	1,30	0,03	—	161,65	7,94	58,80	32,88	—	16.90	5,90	3,90	8,25	—
IX. 5.	0,30	2,97	8,32	9,66	61,50	4.64	37,73	6,52	—	0,08	—	181.17	—	54,10	24,00	—	8.90	2,20	9,43	—	—
IX. 12.	0,43	2,76	7,73	9,33	59,90	4.16	—	—	6,20	0,09	—	168.36	—	49,70	26,80	0,07	7,30	1,70	3,97	—	—
IX. 19.	0,28	2,48	6,94	9,38	50,65	8.72	32,58	2,26	4,00	0,06	—	151,28	1,91	49,00	25,40	007	6,10	2,00	4,47	—	—
IX. 26.	0,31	2,85	7,98	9,66	56,62	7,59	37,45	4,82	3,42	0,07	—	173,85	—	54,70	24,40	0,02	8,70	2,00	5,21	—	—
X. 3.	0,44	2,70	7,56	8,72	52,38	6.06	47,79	4,47	2,00	0,38	(ny)	164,70	—	64,30	25,60	0,01	5,00	2,90	3,52	9,48	2,60
X. 10.	0,40	2,20	6,16	7,70	45,60	5,75	37,85	6,65	5,80	0,09	—	134,20	2,76	54,90	24,40	0,01	5,00	6,20	3,16	—	—
X. 17.	0,37	2,10	5,10	8,46	49,10	5.85	49,40	3,45	1,70	0,21	—	128,10	—	64,70	54.80	0,01	5,20	5,00	4,40	—	—
X. 24.	0,23	1,93	5,40	6,57	37,09	6,02	26,47	2,91	4,40	0,19	—	117,73	—	40,35	28,00	007	16,80	4,80	5,71	—	—
X. 31.	0,38	1,96	5,49	6,56	37,31	5.84	23,51	3,90	7,80	0,08	—	120,17	—	40,10	19,00	0,02	2,70	2,50	4,83	10,08	—
XI. 5.	0,24	1,84	5,15	6,18	32,53	5,41	26,44	2,66	4,10	0,08	—	112,24	—	37,10	20,50	0,02	14,30	1,20	4,64	—	—
XI. 14.	0,20	1,99	5,57	6,76	38,19	6,20	28,28	1,58	6,30	0,10	—	121,32	—	43,31	21,60	0,02	12,20	0,80	3,92	—	—
XI. 21.	0,23	1,98	5,54	7,22	42,48	6,75	27,30	2,62	7,01	0,06	—	120,78	—	50,17	25,80	0,02	11,40	0,80	2,86	—	—
XI. 29.	0,18	1,86	5,21	6,78	35,19	8,21	25,26	2,54	6,56	0,08	—	113,46	—	46,48	21,04	0,02	9,20	2,20	3,47	—	—
XII. 5.	0,15	1,82	5,10	5,82	35,77	4,08	13,36	2,12	11,58	0,35	—	111,02	—	20,69	17,76	0,01	—	—	4,20	—	—
XII. 10.	0,16	1,76	4,93	6,35	32,45	7,89	14,52	2,45	5,96	0,13	—	107,36	—	24,85	19,89	0,02	15,10	0,20	4,03	—	—
XII. 19.	0,28	1,75	4,90	6,94	33,77	9,66	16,52	2,72	7,54	0,06	—	112,85	—	28,85	26,96	0,01	11,80	1,20	3,81	—	—
XII. 23.	0,19	1,71	4,79	5,91	34,13	7,12	9,60	1,57	7,32	0,10	—	104,31	—	25,20	24,99	0,01	11,00	5,00	4,42	—	—
XII. 31.	0,20	1,76	4,93	5,82	34,88	4,38	10,62	2,46	6,00	0,03	—	107,36	—	15,80	23,84	0,01	7,80	7,60	3,61	—	—